FORM-PTO-1390 (Rev. 10-96) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER: 000500-196

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5): 09/380208 Unassigned

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/SE98/00341	25 February 1998	26 February 1997

TITLE OF INVENTION
AN ABSORBENT ARTICLE THAT INCLUDES A LIQUID BARRIER WITH IMPROVED SEALING

APPLICANT(S) FOR DO/EO/US
Eva SIMMONS (nee Eva FRANSSON); Peter RÖNNBERG; and Anders GUSTAFSSON

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and the PCT Articles 22 and 39(1).
4. [X] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [X] has been transmitted by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US)
6. [ ] A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. [X] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [X] have not been made and will not be made.
8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. [ ] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [ ] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment.
    [ ] A SECOND or SUBSEQUENT preliminary amendment.
14. [ ] A substitute specification.
15. [ ] A change of power of attorney and/or address letter.
16. [X] Other items or information:
    INTERNATIONAL SEARCH REPORT AND INTERNATIONAL PRELIMINARY EXAMINATION REPORT.

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
Unassigned 09/380208	PCT/SE98/	000500-196

17. ☒ The following fees are submitted:

	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)):		
Search Report has been prepared by the EPO or JPO $840.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) $670.00		
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) $760.00		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO $970.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) $96.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 970.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	28 -20 =	8	X$18.00	$ 144.00	
Independent Claims	2 -3 =	0	X$78.00	$ 0	
☐ Multiple dependent claim(s) (if applicable)			+ $260.00	$	
TOTAL OF ABOVE CALCULATIONS =				$ 1,114.00	
☐ Reduction for 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				$	
SUBTOTAL =				$ 1,114.00	
☐ Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$ 1,114.00	
☐ Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +				$	
TOTAL FEES ENCLOSED =				$ 1,114.00	
				Amount to be: refunded	$
				charged	$

a. ☒ A check in the amount of $ 1,114.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. 02-4800 in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-4800. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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William C Rowland
SIGNATURE

William C. Rowland
NAME

30,888
REGISTRATION NUMBER

August 26, 1999

Patent
Attorney's Docket No. 000500-196

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	
	)	
Eva SIMMONS et al.	)	Group Art Unit: Unassigned
	)	
Application No.: Unassigned	)	Examiner: Unassigned
	)	
Filed: August 26, 1999	)	
	)	
For: AN ABSORBENT ARTICLE THAT INCLUDES A LIQUID BARRIER WITH IMPROVED SEALING	)	

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination of the above-identified patent application please amend the application as follows:

IN THE CLAIMS:

Please cancel claims 1-14 and substitute therefor new claims 15-42:

--15. A method of achieving in an absorbent article, such as a diaper or an incontinence guard, that includes an absorbent body disposed between a liquid-impermeable bottom sheet which is intended to lie distal from the wearer in use, a liquid-impermeable upper sheet which is intended to lie proximal to the wearer, and either 1) at least one longitudinally extending liquid barrier on each side of the

center line of the upper sheet made of essentially liquid-impervious material and fastened along or adjacent to a respective longitudinally extending side extremity of the article and comprising a free elastic sealing edge intended to be stretched against the wearer, or 2) above the upper sheet, a top liquid-impermeable sheet which is intended to lie against the wearer, includes elastic for shaping the article to the wearer's body, and includes apertures intended to lie in register with the anus and the urethra orifice of the wearer, around which apertures elastically puckered sealing edges are disposed in the top sheet,

an improved sealing ability against the skin of an intended wearer, at a given available elongation, by at least one sealing edge on each side of the center line, comprising modifying or treating the absorbent article in such a way as to cause the absolute value of $\Delta P=2\gamma \cos\theta m/r$ for said sealing edge to increase, where γ designates the surface tension of the liquid to be absorbed by suction, r designates the radius of the largest circle that can be encompassed in any pore formed by said sealing edge against the wearer's skin at the given available elongation, and $\cos\theta m$ is the weighted mean value of $\cos\theta$, where θ is the wetting angle of the liquid to the material in the pore walls, while taking into account the different materials in the walls of this largest pore.

16. The method according to Claim 15, comprising causing said absolute value of ΔP to increase at least within a major part of an available elongation range of 20-40%.

17. The method according to Claim 15, comprising causing said absolute value of ΔP to increase by at least 5%.

18. The method of Claim 15, comprising causing said absolute value of ΔP to increase by at least 15%.

19. The method of Claim 15, comprising causing said absolute value of ΔP to increase by at least 25%.

20. The method of Claim 15, comprising causing said absolute value of ΔP to increase by at least 35%.

21. A method according to Claim 15, comprising causing said pore radius of said sealing edge to decrease at least at an available elongation above 60%.

22. A method according to Claim 15, comprising causing said pore radius of said sealing edge to decrease at least at an available elongation above 50%.

23. A method according to Claim 15, comprising causing said pore radius of said sealing edge to decrease at least at an available elongation above 40%.

24. A method according to Claim 15, comprising causing said pore radius of said sealing edge to decrease at least at an available elongation above 20%.

25. The method according to Claim 15, comprising causing the absolute value of cosθm to increase.

26. The method according to Claim 25, comprising treating said sealing edge such that a higher wetting angle of the liquid to the barrier material will be obtained and/or such that a higher wetting angle of the liquid to the skin of the wearer will be obtained within those regions in which said sealing edge lies against the skin when the absorbent article is donned.

27. The method according to Claim 15, comprising providing said sealing edge with a layer of material that increases the absolute value of cosθm and/or that reduces r when the article is donned.

28. The method according to Claim 15, comprising causing the absolute value of cosθm/r to increase.

29. An absorbent article that includes an absorbent body disposed between a liquid-impermeable bottom sheet which is intended to lie distal from the wearer in use, a liquid-permeable upper sheet which is intended to lie proximal to the wearer, and either 1) at least one longitudinally extending liquid barrier on each side of the center line of the upper sheet, made of essentially liquid-impervious material and fastened along or adjacent to a respective longitudinally extending side extremity of the article and including a free elastic scaling edge intended to be stretched against the wearer, or 2) above the upper sheet, a liquid-impermeable top sheet which is intended to lie against the wearer, includes elastic for shaping the article to the wearer's body, and includes apertures intended to lie in register with the anus and the urethra orifice of the wearer, around which apertures elastically puckered sealing edges are disposed in the top sheet where, in respect of at least one scaling edge on each side of the center line of said absorbent body, the absolute value of $\Delta P=2\gamma \cos\theta m/r$ lies above the line $y=kx+m$, where x designates the available elongation, k has the value -14/30 and m has a value in the range of 48 to 69, within the major part of an available elongation range of between 20 and 40%, and where γ designates the surface tension of the liquid to be absorbed, r designates the radius of the largest circle that can be enclosed in any pore formed by said sealing edge

against the skin of the wearer at a given available elongation, and cosθm is the weighted mean value of cosθ, where θ is the wetting angle of the liquid to the material in the pore walls while taking into account the different materials in the walls of this largest pore.

30. The article according to Claim 29, wherein m equals 48.

31. The article according to Claim 29, wherein m equals 51.

32. The article according to Claim 29, wherein m equals 57.

33. The article according to Claim 29, wherein m equals 63.

34. The article according to Claim 29, wherein m equals 69.

35. The article according to Claim 29, wherein said free sealing edge includes a layer of a material such that a higher wetting angle of the liquid to the edge material will be obtained and/or such that a higher wetting angle of the liquid to the skin of the wearer will be obtained within those

regions in which said sealing edge lies against the skin and where said material smears the skin when the absorbent article is donned.

36. The article according to Claim 29, wherein said free sealing edge is provided with a layer of a material which at least partly fills out the pores in said free sealing edge when the article is donned.

37. The article according to Claim 29, wherein, when the article is donned, said free sealing edge has a pore radius which is essentially independent of the available elongation or stretch and which is at most 0.10 mm.

38. The article according to Claim 37, wherein the pore radius is at most 0.08 mm.

39. The article according to Claim 37, wherein the pore radius is at most 0.04 mm.

40. The article according to Claim 29, wherein said free sealing edge is comprised of a ribbon-like elastic film.

41. The article according to Claim 29, wherein said absolute value of $\Delta P=2\gamma \cos\theta m/r$ lies above the line $y=kx+m$

within the major part of an available elongation range of 15-50%.

42. The article according to Claim 41, wherein the range is 10-60%.--

REMARKS

In the event that there are any questions concerning this amendment, or the application in general, the Examiner is respectfully urged to telephone the undersigned attorney so that prosecution of the application may be expedited.

Respectfully submitted,

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AN ABSORBENT ARTICLE THAT INCLUDES A LIQUID BARRIER WITH IMPROVED SEALING

The present invention relates to absorbent articles, such as diapers or incontinence guards, that provide a better sealing effect against the wearer's skin than earlier known articles of this kind. The invention also relates to a method of producing such articles.

An absorbent article of the kind to which the invention relates will include a liquid-impermeable sheet which is intended to lie distal from the wearer in use, an absorbent body, and an upper liquid-permeable sheet which lies proximal to the wearer in use. When the absorbent article concerned is a diaper or an incontinence guard, the article will also include flexible side flaps or wings that extend laterally beyond the absorbent body on both sides thereof and elastic devices that extend longitudinally along the free side-edges of the side-flaps at least within that part which is intended to form the crotch part of the article in use, said flaps and elastic devices enabling the absorbent article to be fitted to the wearer. These elastic devices function as leg elastic when the article is worn. Thus, when the article is donned, the elastic elements will be stretched and hold the side flaps tightly against the wearer.

Present-day absorbent articles have a very high absorbency and can also retain liquid under pressure. The greatest problems occur in the event of rapid liquid discharges. In such cases, it is necessary for a large volume of liquid to pass first through the top liquid-permeable sheet and then be absorbed by and dispersed in the absorbent body. This does not take place instantaneously. The time taken for the liquid to pass through the top sheet may be from about one to two minutes, during which time liquid will run out to the edges of the article and leak therefrom. These problems are addressed with the aid of so-called liquid barriers or inner cuffs or side-flaps that are intended to resist liquid leakage in the event of rapid liquid discharges. The originally used cuffs were intended primarily to retain faeces and

were formed by folding a part of the liquid-permeable top sheet around an elastic thread. In recent times, manufacturers have begun to produce the cuffs from a liquid-impervious material so as to also retain liquid.

When the leg elastic on the absorbent article is stretched and the article fastened on the wearer, the elastic element of the liquid barriers will also be stretched, thereby raising the barriers up. The elastic element of the barriers will hold the barrier edges under tension against the wearer. The upstanding liquid barriers then form beneath the wearer a "trough" in which a rapidly discharged large volume of urine can be accommodated during the time required for the liquid to pass through the top liquid-permeable sheet. Attempts to improve the effectiveness of such liquid barriers have hitherto been directed towards the use of denser materials and towards flaps of sufficiently large size.

One drawback, however, is that liquid will rise above the brim of the barriers and leak out when the volume of liquid discharged is excessive or when the wearer sits or lies so as to press together the space between the upstanding liquid barriers.

Thus, current absorbent articles, such as diapers or incontinence guards, may include along the outer longitudinal edges of the article sealing edges that are intended to lie tightly around the wearer's thighs and shape the article to the wearer's body, as well as a pair of inner cuffs or liquid-barriers which lie inwardly of the outer longitudinal edges and which are intended to form an impervious barrier against rapidly discharged liquid that is not absorbed immediately by the absorbent body of said article. These inner cuffs shall thus be capable of withstanding a relatively high liquid pressure over a limited period of time of the order of a minute or so. The liquid has been absorbed by the absorbent body when this time period has lapsed. Also available are articles which include transverse cuffs that seal-off the transverse edges of the absorbent body.

Absorbent articles which lack the aforedescribed inner liquid barriers are also available. In such cases, the outer longitudinal sealing edges form the sole liquid barriers of the absorbent body.

Also available are absorbent articles which include a liquid-impermeable sheet that is intended to lie proximal to the wearer in use and that includes elastic threads for shaping the article to the wearer's body. This liquid-impermeable sheet includes at least one aperture for register with the wearer's anus and urethra orifices. Elastic is provided around at least a part of the circumference of the aperture or apertures so as to shape the edges of the aperture to the wearer and to form a seal. Situated beneath the liquid-impermeable sheet is an absorbent body which is enclosed between a liquid-permeable sheet and a liquid-impermeable sheet, such that the absorbent body will hang down beneath the wearer with the liquid-impermeable sheet lying distal therefrom.

The inner cuffs are comprised partly of a thin barrier sheet of essentially liquid-impervious inelastic material, e.g. nonwoven, and partly an elastic device which puckers that edge of the liquid barrier which lies against the wearer. The unresilient and inelastic material is fastened along one longitudinal edge either to the top liquid-permeable sheet of the absorbent article so that no liquid can pass between the two sheets, or to the bottom liquid-impervious sheet along a side edge of the article. The elastic device is fastened along the other edge of the unresilient material, so as to gather the liquid barrier together and therewith form a puckered edge, which will be extended partially when the article is donned. Puckering of this edge is normally achieved with an elastic thread placed in a channel in the inelastic material, said channel being formed by folding over and welding one edge of the material. When the absorbent article is donned, the puckered edge will be stretched partially, the extent of this stretch being dependent on the size of the wearer and how the article is donned.

The described liquid barriers or leg elastic cannot be used in absorbent articles held against the body of the wearer by special elastic pants or panties. These absorbent articles may comprise other sealing edges which are not streched and held tensioned against the body. Thus, EP-A1-0 534 488 describes sealing gaskets which are preformed to extend outward from the central part of an absorbent article, which is illustrated by a sanitary napkin in the description of the preferred embodiment. The gaskets may be formed by looping a strip of material, such as a non-woven material, so as to form a compliant cuff which bears against the user´s body in a comfortable manner. In one embodiment the gaskets are attached directly to the edges of the absorbent article, one edge of the gasket strip being attached to the upper sheet of the absorbent article and the other edge to the lower sheet. The looping of the material form cavitities for imparting compliancy and stability to the gaskets and the looping may also enclose elastic elements that are placed in tension when applied to the article so as to impart an arcuate shape to the article.

In another embodiment the gasket material is an elastic material which is attached to the longitudinally edges of the sanitary napkin. The material is placed in tension when applied to the sanitary napkin. The purpose of doing so is to impart an arcuate shape to the article.

The sanitary napkin is placed in a panty crotch during use and is pressed against the wearer by the force from the panty. Thus, the force applied from the sanitary napkin against the wearer is indirectly caused by pressure from the panty. The gasket embodiments including elastic elements do not cause the force against the body of the wearer. The purpose of the elastic elements are, if they are used, to impart an arcuate shape. This differs from the diaper or incontinence guard according to the invention with a barrier element including an elastic device, wherein the barrier element will get stretched against the wearer during use and thereby creating a liquid barrier with a good sealing effect. It is the body of the user which makes the elastic device in the barrier to get tensioned.

Another type of sealants are described in US-A-5 445 627. A sanitary napkin is provided with a pair of elastically stretchable flaps adjacent transversely opposite side edges. The flaps are in the form of straps and rising from a backsheet. Adhesives are applied on the top surface of said flaps so that the flaps may be adhesively fastened to the user's skin. The intention is to compensate for a shift of the basic body of the napkin relative to the wearer's body. Thus, the napkin is made to adhesivly adhere to the user's skin. This is not a case where an elastic barrier element is stretched against the wearer to obtain a good sealing effect.

The object of the present invention is to provide a method of improving the ability of an absorbent article comprising leg elastic to remain tight against a wearer, with the aid of various measures. Another object of the invention is to provide an absorbent article comprising leg elastic and having improved sealing properties with respect to the wearer of the article.

The invention will now be described with reference to the accompanying drawings, in which

Figs. 1a, b, c illustrate measuring equipment used to determine the leakage pressure or breakthrough pressure for an elastic barrier material. Fig 1a shows the equipment without any applied material, Fig 1b shows the equipment with material applied in a stretched state, and Fig. 1c is a principle illustration of how the leakage pressure is determined;

Figs. 2a, b illustrate schematically a pore in a liquid barrier and the principle of determining the weighted mean value cos θm and determining the radius r;

Fig. 3a illustrates a conventional diaper or incontinence guard with upstanding liquid barriers;

Figs. 3b, c are enlarged principle views of a section through the region B in Fig. 3a, firstly with respect to a conventional diaper (3b) and secondly for an embodiment of the invention (3c);

Figs. 4a, b illustrate the principle of calculating the available elongation or stretch;

Fig. 5a is a graphic illustration showing the measured breakthrough pressures for three different liquid barriers;

Fig. 5b is a comparison diagram illustrating calculated and measured breakthrough pressures for the best liquid barrier in Fig. 5a, at different available degrees of elongation;

Fig. 5c is a diagrammatic illustration of lowest breakthrough pressures for liquid barriers constructed in accordance with the invention;

Fig. 6a is a graphic illustration of the measured breakthrough pressures for a conventional upstanding liquid barrier on the one hand and for two embodiments of the invention on the other hand;

Fig. 6b is a comparison diagram illustrating calculated and measured breakthrough pressures at different available elongations for one of the inventive embodiments shown in Fig. 6a;

Fig. 7 illustrates the measured breakthrough pressures for a conventional upstanding liquid barrier on the one hand and for a further embodiment of the invention on the other hand;

Figs. 8-14 are reproductions of photographs taken with an electron microscope of different liquid barriers at different available elongations; and

Figs. 8a-12a are views corresponding to the photograph reproductions in Figs. 8-12.

An absorbent article, such as a diaper, is manufactured for use by persons of different sizes. This is achieved by gathering together, or puckering, liquid barriers and side-edges with the aid of elastic. These liquid barriers and side-edges will stretch to different extents in accordance with the size of the wearer, and the tension around the edge of the barrier will thus vary in dependence on the size of the wearer.

Tension in the barrier elastic can be expected to have significance in studies on the sealing property of a liquid barrier, and consequently the extent to which the barrier is stretched will also be significant. A significantly stretched barrier will exert significant tension against the wearer's skin and can be expected to provide a better seal than corresponding barriers that are stretched to a lesser extent. One wish in this respect has been to produce the highest possible tension in the liquid barrier and therewith obtain the best possible sealing effect. However, it is not possible to use elastic in which the tension is excessively high, since the absorbent article will then be uncomfortable to wear and leave marks in the skin.

The term "available elongation or stretch" can be used when considering the extent to which a liquid barrier is stretched.

In the manufacture of the absorbent article, e.g. a diaper, the elastic material, which has a given degree of stretchability, is "locked" firmly to remaining non-stretchable material, normally nonwoven. The extent to which the elastic material is stretched in the manufacture of the article cannot be exceeded when the article is in use, since the elastic material is firmly secured to a non-stretchable material. This is shown in Fig. 4a. The elastic material has the length **L** at this point.

The non-stretchable material to which the elastic material is locked is puckered somewhat when the diaper is placed on the wearer's body. The elastic material has then contracted to the smaller length **Lx.**

The available stretch or elongation **X** is the extent to which the material can be stretched from the user state to the maximum stretched state of the product. This can be expressed by the formula: $\mathbf{L = Lx}\ ((\mathbf{X}/100) + 1)$, where **X** is the available stretch or elongation in percent.

Test equipment was constructed with the intention of studying the sealing effect achieved between a liquid barrier or some other puckered barrier and the wearer's skin. This equipment is shown in Figs. 1a, 1b and 1c and comprises a Plexiglas stand which includes a base plate **a** and an upstanding support plate **b**. A first upwardly open, semi-cylindrical element 1 is fastened horizontally to the upstanding support plate **b** and has around its periphery a scale which denotes the available elongation or stretch. One end of the semi-cylindrical element is attached to the support plate while the other end has an end-wall 1'. Provided at the very bottom of the semi-cylindrical element 1 is a hole 2 to which a vertically upstanding filling tube 3 and an inclined measuring tube 4 lead, both of said tubes having a scale expressed in mm water. The equipment also includes a loose second semi-cylindrical element 5 whose diameter is somewhat larger than the diameter of the

first semi-cylindrical element 1 and which has one side open and an end-wall 5' at its other end.

As shown in Fig. 1b, a measuring operation is carried out by securing a liquid barrier around the outer periphery of the first semi-cylindrical element and fastening said barrier around the upper edges. The elastic part 7 is directed towards the attachment of the semi-cylindrical element to the support plate b, and the liquid barrier material is folded around the end-wall 1' of the first semi-cylindrical element 1 on the other side. The elastic part is fastened along the scale on the semi-cylindrical element so as to enable the available elongation or stretch to be read-off. The end-wall 5' of the second semi-cylindrical element 5 is placed against the end-wall 1' of the first semi-cylindrical element with said upfolded part of said barrier material located therebetween and pressed thereagainst with the aid of a clamp 10, such as to obtain a small clearance 9 between the cylindrical walls. Synthetic urine is introduced through the vertical tube 3. The liquid barrier is first weighted down so as to fill the clearance between the semi-cylindrical elements. A liquid pressure is thereafter built-up against the elastic edge 7 at the same time as a liquid column is formed in the tubes 3, 4, where the pressure can be read-off. Liquid is introduced until leakage occurs at arrow B (Fig. 1c) at the breakthrough pressure.

Three available types of liquid barriers, Huggies standing gather, Pampers standing gather and Peaudouce leg elastic, have been studied with this equipment, the leakage tendency with the elastic element stretched to and locked at different available elongations being measured. The liquid pressure at which leakage will occur in respect of a barrier stretched to a given extent, i.e. a barrier that has a given available elongation or stretch, has been determined with the aid of the test equipment, this pressure being found to vary in dependence on the extent to which the puckered edge is stretched. The measured values are shown in the diagram in Fig. 5a. As will be evident from the Figure, however, different barriers give different breakthrough pressures at the same available stretch or elongation. It thus

appears that the sealing effect is influenced by other factors than solely the tension in the elastic material.

The invention is based on an attempt to provide an improved sealing effect on the basis of factors other than the actual tension in the elastic.

On the basis of the theory that leakage does not occur merely because the elastic in the barrier material releases its contact with the wearer's skin but first occurs through the through-penetrating pores or channels that are formed between the wearer's skin and the folds in the puckered edge of the barrier material, endeavours have been made to create a model from which the leakage pressure can be determined theoretically and thereby become aware of those parameters that shall be influenced in order to achieve a better sealing effect.

The capillary pressure of the pores in porous structures can be calculated with the Laplace equation.

According to Laplace, the capillary pressure $\Delta P = 2\gamma \cos\theta/r$, where γ is the surface tension of the liquid, θ is the wetting angle of the liquid to the material in the capillary walls, and r is the radius of the capillary. When θ is greater than 90°, $\cos\theta$ is negative and ΔP is consequently also negative. The capillary wall is hydrophobic and the resultant pressure ΔP can be said to describe the breakthrough pressure, i.e. the maximum pressure a capillary or pore can withstand. When θ is less than 90°, the capillary wall is hydrophilic and ΔP and $\cos\theta$ are positive. Liquid is then "sucked" into the pores.

When studying the pressure in a capillary or pore, where the wall consists of several materials, such as in a pore formed between skin and a fold in a liquid barrier, the proportion of circumference of each material must be weighed together so as to

provide a mean value of cosθ, hereinafter designated cosθm. The breakthrough pressure will then be $\Delta P = 2\gamma \cos\theta m/r$.

In the present case, the walls of the pores consist partly of an hydrophilic material, i.e. skin, which has a wetting angle of less than 90°, and partly of the hydrophobic material in the liquid barrier, which has a wetting angle above 90°. Cosθm is the weighted mean value of the pore wall's cosθ-values and is calculated in the manner illustrated in Fig. 2a, where A designates the circumference proportion hydrophobic wall and B designates the circumference proportion hydrophilic wall, where A + B = 1. Cosθm will therewith equal $A \cdot \cos\theta_{fob} + B \cdot \cos\theta_{fil}$.

As described below, trials have been carried out with the intention of checking whether or not the described model can be used as a basis on which the breakthrough pressure can be evaluated.

The wetting angle of the skin varies in accordance with the state of the skin, i.e. whether the skin is clean or dirty, for instance. Measuring equipment comprised of Plexiglas with a wetting angle of 77°, which lies close to the mean value of the wetting angle of the skin (about 74°), was used for comparison purposes. Measurement were carried out on the commercial liquid barrier that produced the best sealing result according to Fig. 5a, i.e. Huggies standing gather which has a wetting angle of 120°. The liquid used was synthetic urine. γ is the surface tension of synthetic urine, i.e. 0.06 N/m.

Abutment of a liquid barrier against the measuring equipment was studied at different available elongations with an electron microscope, enlargement 130 times, as illustrated in Figs. 8-12 and Figs. 8a-12a. As will be evident from the Figures, a through-penetrating pore is formed between the threads or fibres of the barrier material and the Plexiglas wall of the test equipment. This pore is assumed to

function as a capillary, where r = the radius of the largest possible circle that can be enclosed in the channel, as evident from Fig. 2b.

The through-penetrating pore has been drawn in Figs. 8a-12a. The following pore-radius values were obtained at different available elongations, as shown in the Figures.

Available Elongation	Pore Radius
10%	0.0208 mm
20%	0.0812 mm
30%	0.1208 mm
40%	0.1458 mm
50%	0.1458 mm

Comments: It was very difficult to measure the pore radius on the photograph at a 10% available elongation, and the value given is therefore perhaps unreliable.

The crosses shown in Figs. 8a-12a show the lateral terminal points of the pore intended for calculating the hydrophobic and hydrophilic length-proportions of the pore. The length ratio between hydrophobic and hydrophilic surfaces in the pore at different available elongations is shown in the following Table.

Avail. elong	Hydrophil. surface	Hydrophob. surface
10%	39%	61%
20%	39%	61%
30%	32%	68%
40%	39%	61%
50%	50%	50%

Calculations relating to "Huggies standing gather" against Plexiglas:

10% available elongation

$\Delta P = 2 \cdot 0.06 \cdot (0.39 \cdot \cos 74° + 0.61 \cdot \cos 120°) / 0.0208 \cdot 10^{-3}$

ΔP = -1139 Pa => the absolute value of the breakthrough pressure = 114 mm H_2O

20% available elongation

$\Delta P = 2 \cdot 0.06 \cdot (0.39 \cdot \cos 74° + 0.61 \cdot \cos 120°) / 0.0812 \cdot 10^{-3}$

ΔP = -291.9 Pa => the absolute value of the breakthrough pressure = 29.2 mm H_2O

30% available elongation

$\Delta P = 2 \cdot 0.06 \cdot (0.32 \cdot \cos 74° + 0.68 \cdot \cos 120°) / 0.1208 \cdot 10^{-3}$

ΔP = -250.1Pa => the absolute value of the breakthrough pressure = 25.0 mm H_2O

40% available elongation

$\Delta P = 2 \cdot 0.06 \cdot (0.39 \cdot \cos 74° + 0.61 \cdot \cos 120°) / 0.1458 \cdot 10^{-3}$

ΔP = -162.6 Pa => the absolute value of the breakthrough pressure = 16.3 mm H_2O

50% available elongation

$\Delta P = 2 \cdot 0.06 \cdot (0.5 \cdot \cos 74° + 0.5 \cdot \cos 120°) / 0.1458 \cdot 10^{-3}$

ΔP = -92.3 Pa => the absolute value of the breakthrough pressure = 9.2 mm H_2O

Fig. 5b shows a comparison between the breakthrough pressures measured with the test equipment and the breakthrough pressures calculated with the above formula.

Since the calculated and measured breakthrough pressures are in good agreement, it is thus possible to improve the sealing effect of the liquid barrier in an absorbent article against the wearer's skin by influencing $|\Delta P|$, i.e. $|(2\gamma \cos\theta m/r)|$, of the barrier so that this value increases. One provision in this respect is that the tension in the elastic will be sufficiently high to prevent the liquid barrier from allowing liquid to escape at a lower pressure as a result of the elastic relaxing and allowing

the barrier to "ease" away from the wearer by virtue of the liquid column weighing down the barrier so that it releases its contact with the abutment surface.

$|\Delta P|$ can be caused to increase by increasing the product $|(2\gamma \cos\theta m/r)|$

The invention thus relates to a method of improving the sealing ability of an absorbent article by causing the product $-(2\gamma \cos\theta m/r)$ of one or more of the liquid barriers of the article to increase.

The product can be increased by, for instance
1) influencing the wetting angle between the liquid to be sucked up and the skin or the barrier material, respectively;
2) influencing the pore radius, i.e. the capillary radius, formed between the barrier material and the skin; and
3) influencing both wetting angle and pore radius.

Because the effect intended is to increase the absolute value of the product $2\gamma \cos\theta m/r$, it is not necessary to unilaterally increase $|\cos\theta m|$ or decrease r. It is possible for a procedure of increasing $|\cos\theta m/r|$ to also involve simultaneous increase of the radius. Provided that the increase in $|\cos\theta m|$ is proportionally greater than the increase in radius, an improved result will be obtained despite the increase in radius. Similarly, a procedure that decreases the radius may result in a decrease in $|\cos\theta m|$. An improved result will still be achieved, however, provided that this latter decrease is proportionally smaller than the decrease in radius.

The invention also relates to an absorbent article such as a diaper or an incontinence guard that has improved sealing properties against a user and which has been produced so that in the case of at least a pair of the liquid barriers of the article, the absolute value of the product $2\gamma \cos\theta m/r$ will be higher than that obtained when using earlier known absorbent articles. More specifically, during the greater part of

the interval 20-40% available elongation or stretch, preferably during the major part of the interval between 15 and 50%, and particularly during the major part of the interval between 10 and 80% available elongation, the absolute value y of the product $2\gamma \cos\theta m/r$ will lie above line $y=kx+m$, where x designates the available elongation or stretch, k has the value -14/30 and m has the value 48 (line 1), preferably 51 (line 2), more preferably 57 (line 3) and even more preferably 63 (line 4) and in particular 69 (line 5). These lines are shown in Fig. 5c, in which the measured breakthrough pressure of the most effective liquid barrier known at present, i.e. the Huggies standing gather barrier, has been drawn by way of comparison.

The invention will now be described in more detail with reference to particular exemplifying embodiments and also with reference to the accompanying drawings.

Examples

Fig. 3a shows a conventional diaper or incontinence guard 20 which includes a liquid-permeable top sheet 22, an absorbent sheet 23, and a liquid-impermeable bottom sheet 21, said sheets being delimited by two transverse edges 24, 25 and two longitudinal edges 26, 27. The illustrated article also includes longitudinally extending leg elastic 28 and an upstanding liquid barrier 29 on each side of the longitudinal centre line. Fig. 3b is a sectional view that illustrates the construction of the upstanding liquid barrier comprising a liquid-impermeable sheet 12 whose free edge is curved around two stretched elastic threads 13. The threads 13 function to pucker the sheet 12.

Fig. 3c illustrates an embodiment of the invention in which the pore radius has been significantly reduced, and is constant and small already at high available elongation or stretch. In this case, the elastic threads 13 have been replaced by an elastic film

14. This film will lie essentially smoothly against the skin. The pore radius is close to 0 already at a high available elongation.

Fig. 14 is a reproduction of an electron microscope photograph of an inventive embodiment similar to the embodiment of Fig. 3c, in which an elastic film is used as the edge on the liquid barrier, stretched against the Plexiglas. The small pores that can be seen are the result of the film being a three-ply film in the illustrated case, where only the centre layer is elastic. The outer layers used to join the film to the barrier will crack when the centre layer is stretched, as shown in Fig. 15. The visible small pores, which have a radius of about 0.02 mm, will remain essentially constant irrespective of the available elongation, since the height of the pores is constant even though the length is changed. The uppermost curve in Fig. 7 illustrates measurements made with this liquid barrier. The lower curve shows the results obtained with a Huggies standing gather.

The wetting angle was changed in two tests. In the first case, a plastic film having a wetting angle of 97.5° was stretched over the first semi-cylindrical Plexiglas surface. This corresponds to a treatment of the barrier such that the wearer's skin will obtain a higher wetting angle. This is hydrophobic in distinction to the normal skin mean wetting angle of about 74°. The result of this change in the wetting angle (centre curve) is compared in Fig. 6a with the sealing effect achieved with the upstanding liquid barrier Huggies standing gather (lowermost curve). As the measuring values show, an improved sealing effect is achieved in this way.

The uppermost curve in Fig. 6a shows measurements obtained with a liquid barrier that had been treated with Vaseline. Vaseline has a wetting angle of 100°. The Vaseline partially blocks the pores, i.e. reduces the pore radius, and also smears the wearer's skin, thereby increasing the wetting angle of the liquid to the skin. As will be evident from the diagram shown in Fig. 6a, there is obtained a significant improvement that exceeds the improvement achieved when only the wetting angle of the skin is changed, despite obtaining, at the same time, a reduction in the wetting

angle of the barrier by virtue of the Vaseline also smearing the liquid barrier and therewith lowering its wetting angle from 120° to 100°.

Fig. 6b is a diagram in which the calculated and measured sealing effects obtained when changing the wetting angle are shown. The measured values have been obtained by covering the Plexiglas with the aforedescribed plastic film, and corresponds to the centre curve in the diagram shown in Fig. 6a. Good agreement is obtained between the calculated and measured values.

As will be evident from the aforegoing, the sealing effect provided by an absorbent article can be improved by treating at least one of its liquid barriers in a manner such as to cause the absolute value of the negative product $2\gamma \cos\theta m/r$ to increase at least within the major part of an available elongation range of 20-40%. The sealing effect of an article having a liquid barrier where the absolute value of the negative product $2\gamma \cos\theta m/r$ lies above the line $y=kx+m$ at least within the major part of an available elongation range of 20-40%, where x designates the available elongation or stretch, k has the value -14/30 and m has the value 48, preferably 51, more preferably 57, and even more preferably 63 and particularly 69, will be substantially better than the sealing effect achieved with conventional articles of this nature.

The invention also relates to articles that have transverse liquid barriers, and to a method of treating such liquid barriers in the same manner as that described with respect to the longitudinally extending liquid barriers.

The longitudinally extending liquid barriers may be comprised of both leg elastic and inner cuffs.

It will be understood that the invention is not restricted to the described exemplifying embodiments thereof and that it includes all conceivable embodiments that lie within the scope of the following Claims.

New Claims

1. A method of achieving in an absorbent article such as a diaper or an incontinence guard that includes an absorbent body (23) disposed between a liquid-impermeable bottom sheet (21) which is intended to lie distal from the wearer in use, a liquid-permeable upper sheet (22) which is intended to lie proximal to the wearer, and either 1) at least one longitudinally extending liquid barrier (28, 29) on each side of the centre line of said upper sheet, made of essentially liquid-impervious material (12) and fastened along or adjacent to a respective longitudinally extending side extremity of the article and comprising a free elastic sealing edge intended to be streched against the wearer, or 2) above the upper sheet (22), a top liquid-impermeable sheet which is intended to lie against the wearer, includes elastic for shaping the article to the wearer's body, and includes apertures intended to lie in register with the anus and the urethra orifice of the wearer, around which apertures elastically puckered sealing edges, are disposed in the top sheet,
an improved sealing ability against the skin of an intended wearer, at a given available elongation, by at least one sealing edge (28, 29) on each side of said centre line, **characterized** by modifying or treating the absorbent article in such a way as to cause the absolute value of $\Delta P=2\gamma \cos\theta m/r$ for said sealing edge (28, 29) to increase, where γ designates the surface tension of the liquid to be absorbed by suction, r designates the radius of the largest circle that can be encompassed in any pore formed by the sealing edge against the wearer's skin at the given available elongation, and $\cos\theta m$ is the weighted mean value of $\cos\theta$, where θ is the wetting angle of the liquid to the material in the pore walls, while taking into account the different materials in the walls of this largest pore.

2. A method according to Claim 1, characterized by causing the absolute value of ΔP to increase at least within the major part of an available elongation range of 20-40%.

3. A method according to Claim 1 or 2, characterized by causing the absolute value of ΔP to increase by at least 5%, particularly by at least 15%, preferably by at least 25%, and then particularly by at least 35%.

4. A method according to any one of the preceding Claims, characterized by causing the pore radius of the sealing edge to decrease at least at an available elongation above 60%, particularly at an available elongation above 50%, more particularly at an available elongation above 40% and then preferably at an available elongation above 20%.

5. A method according to any one of the preceding Claims, characterized by causing the absolute value of $\cos\theta m$ to increase.

6. A method according to Claim 5, characterized by treating the sealing edge such that a higher wetting angle of the liquid to the barrier material will be obtained and/or such that a higher wetting angle of the liquid to the skin of the wearer will be obtained within those regions in which the sealing edge lies against the skin when the absorbent article is donned.

7. A method according to any one of the preceding Claims, characterized by providing the sealing edge with a layer of material that increases the absolute value of $\cos\theta m$ and/or that reduces r when the article is donned.

8. A method according to any one of Claims 1-7, characterized by causing the absolute value of $\cos\theta m/r$ to increase.

9. An absorbent article that includes an absorbent body (23) disposed between a liquid-impermeable bottom sheet (21) which is intended to lie distal from the wearer in use, a liquid-permeable upper sheet (22) which is intended to lie proximal to the wearer, and either 1) at least one longitudinally extending liquid barrier (28, 29) on each side of the centre line of said upper sheet, made of essentially liquid-impervious material (12) and fastened along or adjacent to a respective longitudinally extending side extremity of the article and comprising a free elastic sealing edge intended to be streched against the wearer, or 2) above the upper sheet (22), a liquid-impermeable top sheet which is intended to lie against the wearer, includes elastic for shaping the article to the wearer's body, and includes apertures intended to lie in register with the anus and the urethra orifice of the wearer, around which apertures elastically puckered sealing edges are disposed in the top sheet, characterized in that in respect of at least one sealing edge (28, 29) on each side of the centre line of said absorbent body the absolute value of $\Delta P=2\gamma \cos\theta m/r$ lies above the line $y=kx+m$, where x designates the available elongation, k has the value -14/30 and m has the value 48, particularly 51, preferably 57, more preferably 63 and in particular 69, within the major part of an available elongation range of between 20 and 40% and where γ designates the surface tension of the liquid to be absorbed, r designates the radius of the largest circle that can be enclosed in any pore formed by the sealing edge against the skin of the wearer at a given available elongation, and $\cos\theta m$ is the weighted mean value of $\cos\theta$, where θ is the wetting angle of the liquid to the material in the pore walls while taking into account the different materials in the walls of the largest pore.

10. An article according to Claim 9, characterized in that the free sealing edge includes a layer of a material such that a higher wetting angle of the liquid to the edge material will be obtained and/or such that a higher wetting angle of the liquid to the skin of the wearer will be obtained within those regions in which the sealing edge lies against the skin and where said material smears the skin when the absorbent article is donned.

11. An article according to Claim 9 or 10, characterized in that the free sealing edge is provided with a layer of a material which at least partly fills out the pores in said edge when the article is donned.

12. An article according to any one of Claims 9-11, characterized in that when the article is donned, the free sealing edge has a pore radius which is essentially independent of the available elongation or stretch and which is at most 0.10 mm, preferably at most 0.08 mm and most preferably at most 0.04 mm.

13. An article according to any one of Claims 9-12, characterized in that the free sealing edge is comprised of a ribbon-like elastic film.

14. An article according to any one of Claims 9-13, characterized in that the absolute value of $\Delta P=2\gamma \cos\theta m/r$ lies above the line $y=kx+m$ within the major part of an available elongation range of 15-50%, preferably within the major part of the range 10-60%.

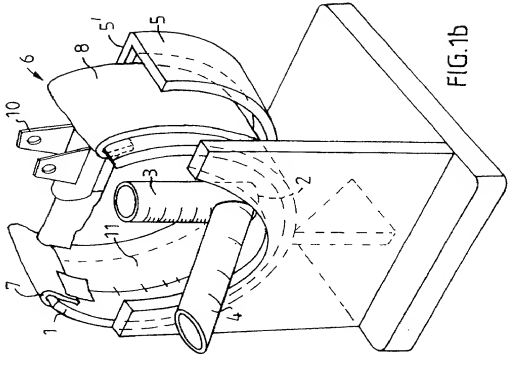

FIG.1b

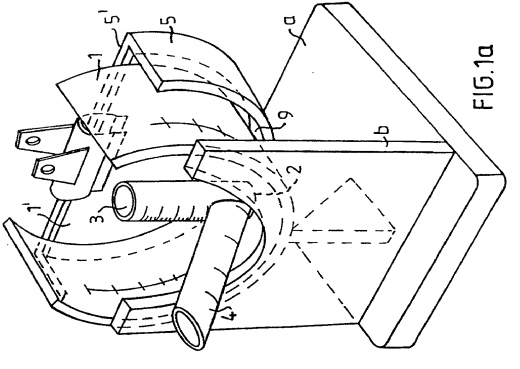

FIG.1a

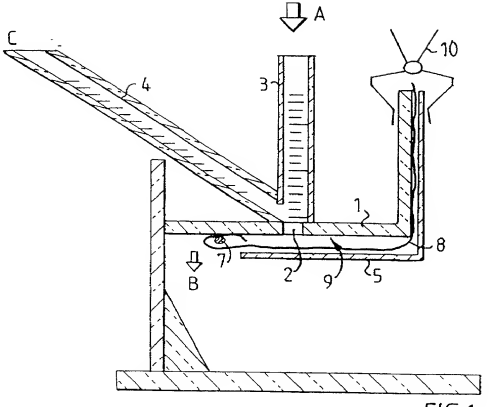

FIG.1c

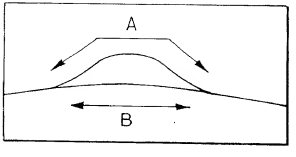

FIG. 2a

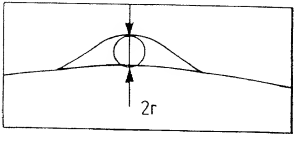

FIG. 2b

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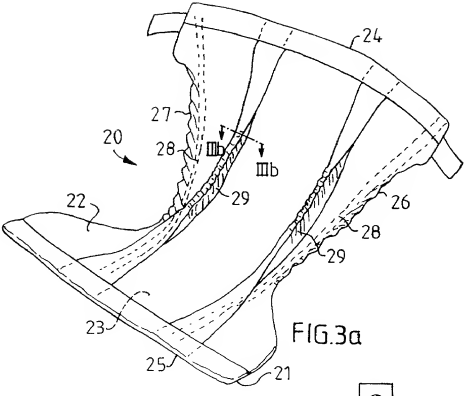


FIG.3a

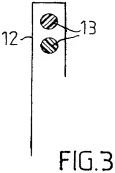


FIG.3b

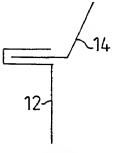


FIG.3c

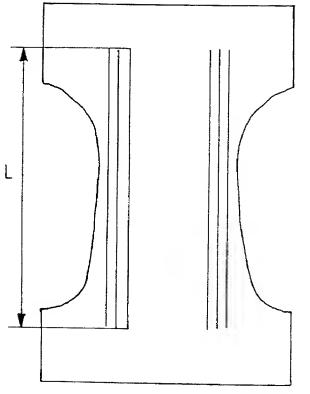


FIG. 4a

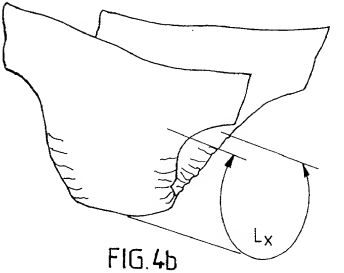


FIG. 4b

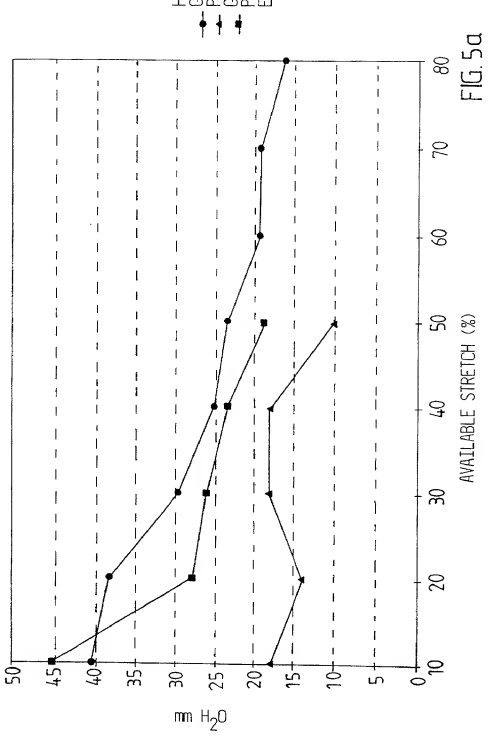

HUGGIES STANDING GATHER
PAMPERS STANDING GATHER
FEADDUCE LEG ELASTIC
mm H_2O
AVAILABLE STRETCH (%)
50
45
40
35
30
25
20
15
10
5
0
10
20
30
40
50
60
70
80

FIG. 5a

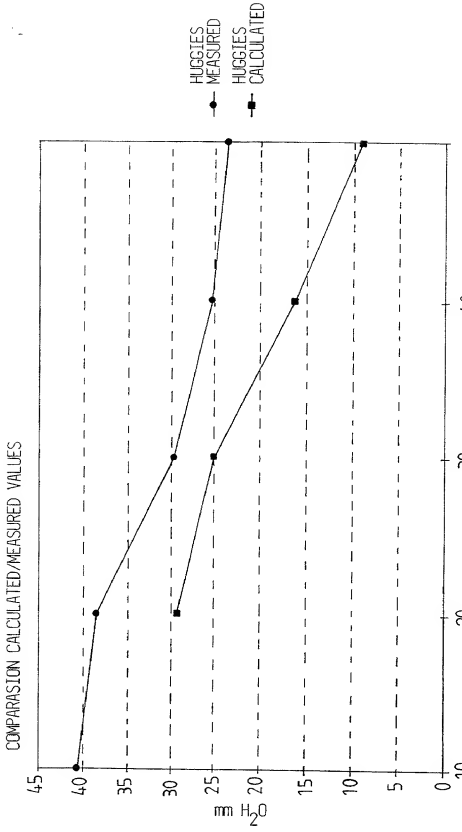

COMPARISION CALCULATED/MEASURED VALUES
HUGGIES MEASURED
HUGGIES CALCULATED
mm H_2O
AVAILABLE STRETCH (%)
0
5
10
15
20
25
30
35
40
45
10
20
30
40
50

FIG. 5b

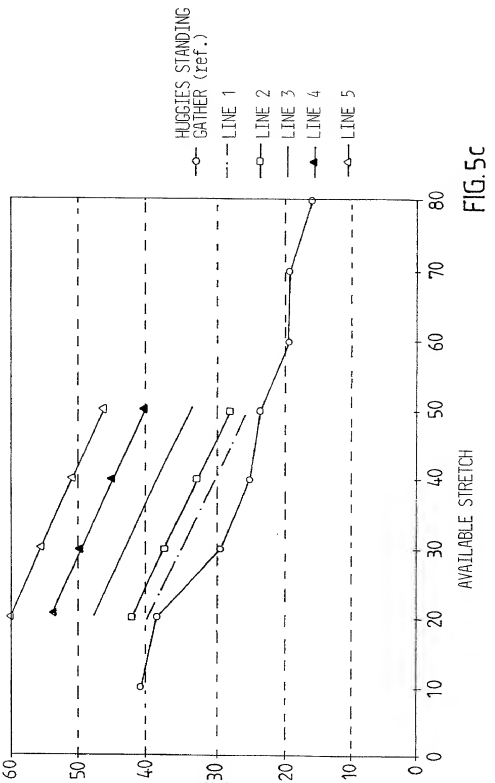


FIG. 5c

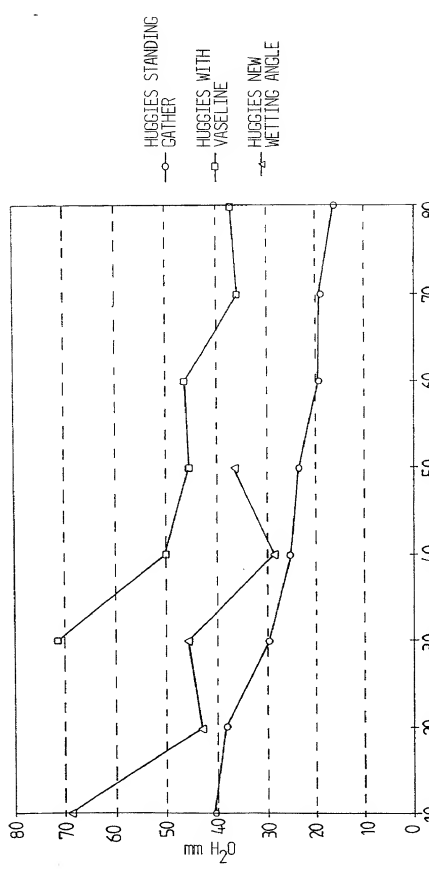

HUGGIES STANDING GATHER
HUGGIES WITH VASELINE
HUGGIES NEW WETTING ANGLE
mm H_2O
80
70
60
50
40
30
20
10
0
10
20
30
40
50
60
70
80

FIG.6a

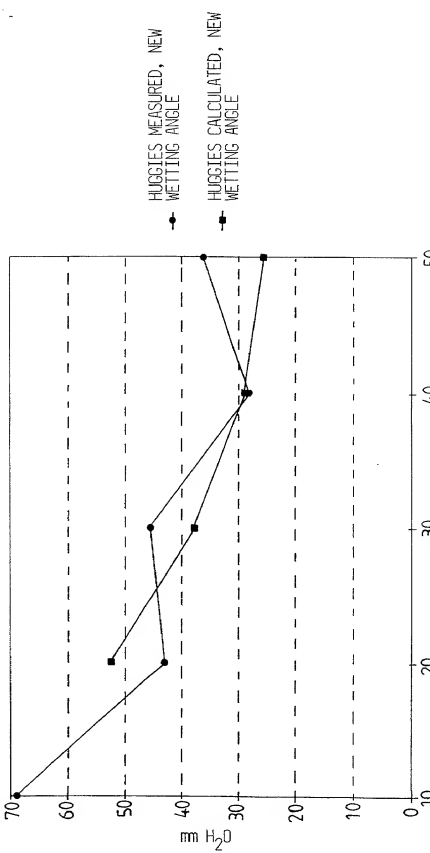

HUGGIES MEASURED, NEW WETTING ANGLE
HUGGIES CALCULATED, NEW WETTING ANGLE
mm H_2O
70
60
50
40
30
20
10
0
10
20
30
40
50
AVAILABLE STRETCH (%)

FIG. 6b

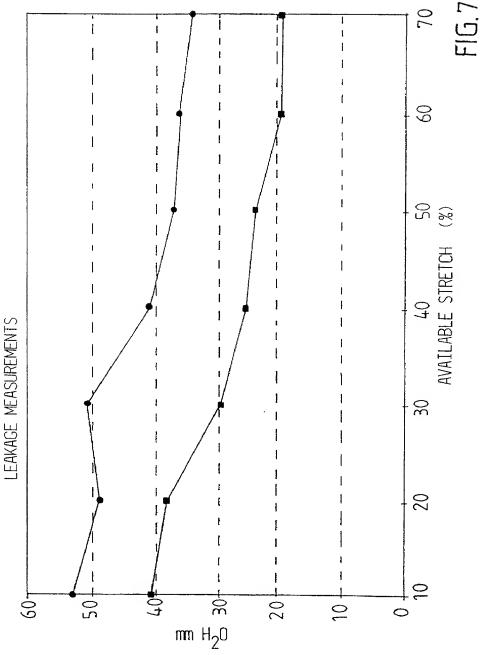
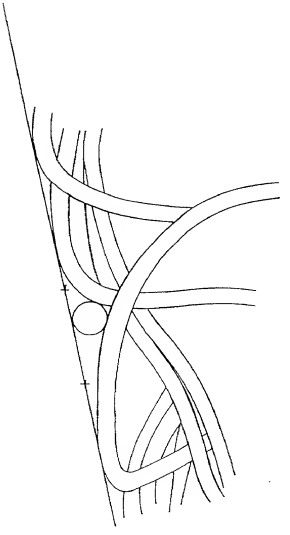


FIG. 7

09/380208

FIG.8



$\varnothing D = \frac{10}{240} = 0{,}04176$ mm

FIG. 8a

$L_{fil} = 32$ mm

$L_{fob} = 50$ mm

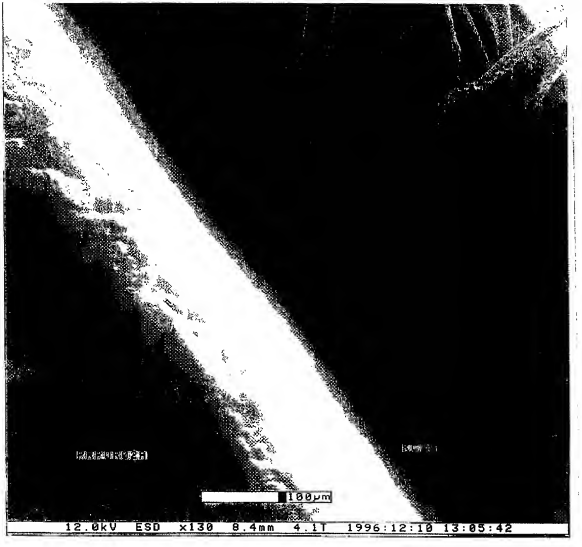


FIG.9

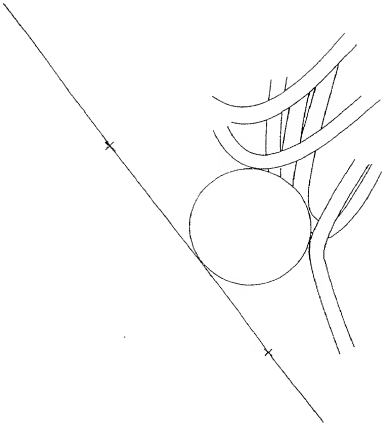


FIG. 9a

$$ØD = \frac{39}{240} = 0.1625 \text{ mm}$$

$L_{fil} = 83$ mm

$L_{fob} = 130$ mm

FIG. 10

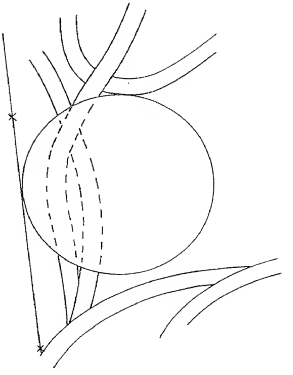


FIG. 10a

$\varnothing D = \frac{58}{240} = 0,24167$ mm

$L_{fil} = 95$ mm

$L_{fob} = 205$ mm

FIG. 11

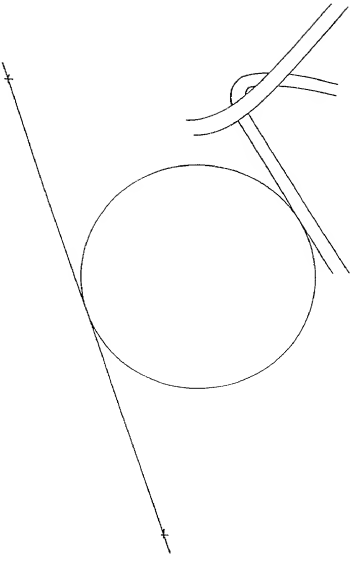


FIG.11a

$ØD = \frac{70}{240} = 0,29167$ mm

$L_{fil} = 155$ mm

$L_{fob} = 245$ mm

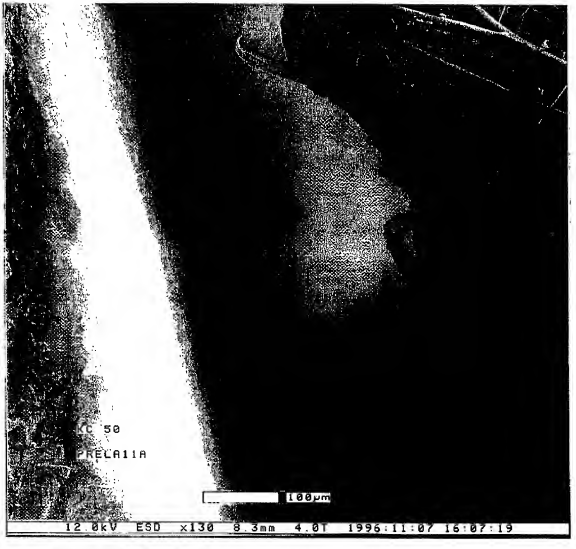


FIG. 12

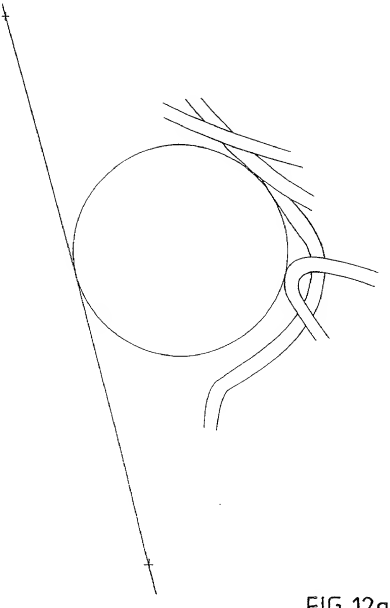


FIG. 12a

$$\text{ØD} = \frac{70}{240} = 0{,}29167 \text{ mm}$$

$$L_{fil} = L_{fob}$$

FIG.13

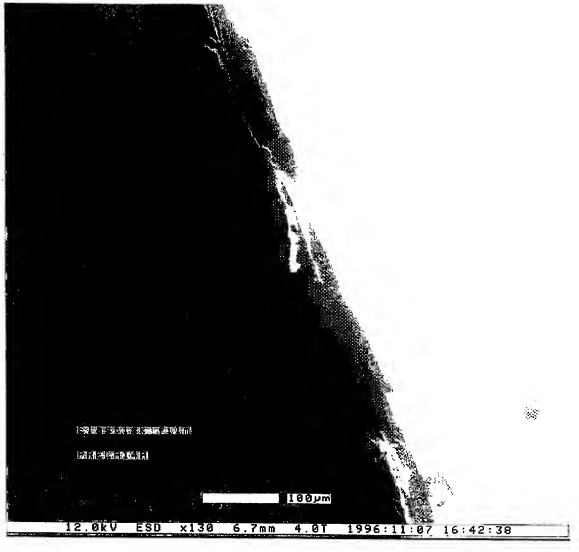


FIG. 14

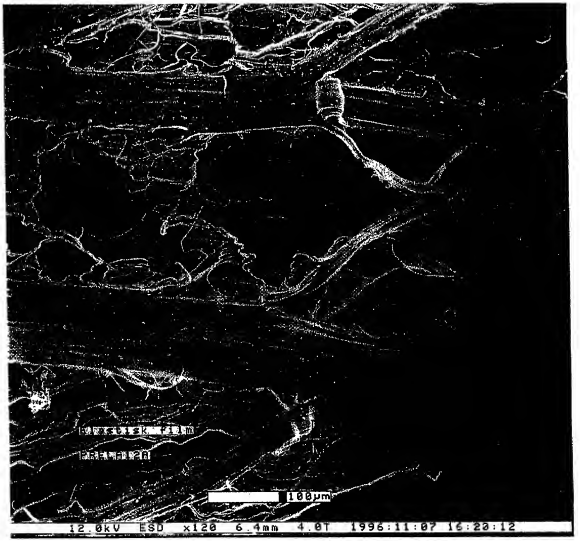


FIG.15

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY
(Includes Reference to Provisional and PCT International Applications)

ATTORNEY'S DOCKET NUMBER
0005500-196

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name;
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

An Absorbent Article that Includes a Liquid Barrier with Improved Sealing

the specification of which (check only one item below):

☐ is attached hereto.

☐ was filed as United States application

Number _____

on _____

and was amended

on _____ (if applicable).

☒ was filed as PCT international application

Number PCT/SE98/00341

on 25 February 1998

and was amended under PCT Article 19

on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §§ 119 (a)-(e) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119:

COUNTRY (if PCT, indicate "PCT")	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. § 119
Sweden	SE 9700693-6	26 February 1997	X Yes __ No
			__ Yes __ No
			__ Yes __ No
			__ Yes __ No
			__ Yes __ No

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

_____ _____
(Application Number) (Filing Date)

_____ _____
(Application Number) (Filing Date)

(1/99)

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONTINUED)
(Includes Reference to Provisional and PCT International Applications)

ATTORNEY'S DOCKET NO. 000500-196

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States applications(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, § 112. I acknowledge the duty to disclose to the Office all information known to me to be material to the patentability as defined in Title 37, Code of Federal Regulations § 1.56, which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. § 120:

U.S. APPLICATIONS		STATUS *(check one)*		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED

PCT APPLICATIONS DESIGNATING THE U.S.

PCT APPLICATION NO.	PCT FILING DATE	U.S. APPLICATION NUMBERS ASSIGNED (if any)			
PCT/SE98/00341	25 February 1998				

I hereby appoint the following attorneys and agent(s) to prosecute said application and to transact all business in the Patent and Trademark Office connected therewith and to file, prosecute and to transact all business in connection with international applications directed to said invention:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

(1/99)

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONTINUED)
(Includes Reference to Provisional and PCT International Applications)

ATTORNEY'S DOCKET NO. 000500-146

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